

Amendments to the Specification

Please amend the paragraph starting at page 1, line 22 and ending at page 2, line 12, as follows.

However, the conventional inks used in ink-jet recording generally comprise, as a principal component, water, and additionally include a water-soluble high boiling solvent such as glycol for the purpose of preventing drying and clogging at orifices, and the like. When such an ink is used to conduct recording on plain paper, there have hence ~~been offered~~ arisen such problems ~~that~~ as fixing ability cannot be sufficiently achieved, and image irregularity occurs, which appears to be attributed to the uneven distribution of a filler and/or a size on the surface of the paper. In particular, when color images are intended ~~to form~~ to be formed, plural inks of different colors are overlapped one after another before they are fixed to paper. Therefore, color bleeding and uneven color mixing have occurred at portions of boundaries between images of different colors (this phenomenon will hereinafter be referred to as "bleeding" simply), resulting in a failure to obtain satisfactory images.

The paragraph starting at page 6, line 3 and ending at line 19 has been amended as follows.

As described above, ~~the~~ various proposals using the color ink and reaction liquid as a means for improving the anti-bleeding property have been made. ~~At~~ In all events, the anti-bleeding property is improved to some extent, but the deterioration of coloring property and the show through occur when importance is attached to the fixing ability. On the other hand, the fixing ability is deteriorated when importance is attached to the coloring property and the show through. In other words, under the circumstances, any method that can satisfy the fixing ability and the coloring property and the show through at the same time while reducing the bleeding is has not been proposed. Further, the proposal that the amount of the reaction liquid applied is defined is a proposal that its ratio to the amount of the color ink applied is specified, so that the proposal cannot be always be said to be optimum according to the recording method and conditions.

The paragraph starting at page 20, line 7 and ending at line 12 has been amended as follows.

Here the total charge concentration is defined as the number of the polyvalent metal ~~ion~~ ions per unit mass for the reaction liquid and as the number of the

ions of the opposite polarity such as carboxylic acid ions, sulfonic acid ions, phosphoric acid ions and the like per unit mass for the pigment ink.

The paragraph starting at page 24, line 8 and ending at line 27 has been amended as follows.

In the ink-jet recording process that becomes prerequisite conditions as described above, cases where each of the conditions is omitted will hereinafter be described. The case where the reaction liquid is brought into contact with the ink at another portion than the surface of the recording medium 10 will be first described. When the reaction liquid 20 being impregnated into the recording medium 10 is brought into contact with the pigment ink 30, almost all the reaction takes place in the recording medium 10. Therefore, the distribution of the pigment particles becomes higher in the interior of the recording medium 10 than the surface thereof, whereby no high coloring ability can be achieved. Since no formation of the agglomerates 31b at the interface of the reaction liquid occurs, any filmy aggregate 31c that is an aggregate of the agglomerates 31b should not be formed. High coloring ability cannot be also achieved ~~from~~ for this reason. In addition, a problem of the show through that the coloring material ~~is shown~~ shows through from the backside of the recording medium is also caused.

The paragraphs starting at page 27, line 18 and ending at page 28, line 19 have been amended as follows.

Rx(dpi) is a print (or recording) resolution in a recording direction. The recording direction is a direction of relative scanning between a recording head and the recording medium accompanied by an ejecting operation of the reaction liquid.

Incidentally, “dpi” is an abbreviation of “dots/inch” and a unit indicating the number of dots per inch.

Ry(dpi) is a print (or recording) resolution in an arrangement direction of the nozzles in the recording head. The arrangement direction of the nozzles is substantially perpendicular to the recording direction by the relative scanning.

~~duty~~ Duty(%) denotes a print (or recording) duty of the reaction liquid. The term “print duty” (or “recording duty”) as used herein means a proportion of actually ejected dots to the number of pixels defined by the print resolutions (Rx, Ry). For example, when the print resolutions (Rx, Ry) are 1200 dpi and 1200 dpi, respectively, a unit area of 1/1200 inch × 1/1200 inch can be defined as a pixel. The number of pixels in a prescribed area on the recording medium is also defined like this. The print duty of the reaction liquid in the prescribed area is calculated ~~out~~ by [(the number M of dots actually ejected to the prescribed area) ÷ (the number N of pixels in the prescribed area) × 100]. Incidentally, the prescribed area may be an area corresponding to the whole area on the

recording medium, one band area corresponding to one scanning of the recording head or a divided area obtained by further dividing this one band area.

The paragraph starting at page 29, line 7 and ending at line 17 has been amended as follows.

Figs. 16 to 18 are graphs obtained by plotting ejection conditions (ejection volume V_d , print duty) of reaction liquids shown in Examples and Comparative Examples of Table 1 at every print ~~resolutions~~ resolution (R_x , R_y). Fig. 16 diagrammatically illustrates the relationship between an ejection volume $V_d(pl)$ and a print duty of a reaction liquid when print resolutions R_x and R_y are 1200 and 1200, respectively. Fig. 17 diagrammatically illustrates the relationship between an ejection volume $V_d(pl)$ and a print duty of the reaction liquid when print resolutions R_x and R_y are 600 and 1200, respectively.

The paragraph starting at page 40, line 13 and ending at line 20 has been amended as follows.

~~when~~ When such an alkali-soluble resin as described above is used as a dispersing agent, it is necessary to add a base for dissolving the resin in the dispersion.

Preferable examples of the base used in this case include organic amines such as monoethanolamine, diethanolamine, triethanolamine and amine methylpropanol, ammonia, and inorganic bases such as potassium hydroxide and sodium hydroxide.

The paragraph starting at page 42, line 17 and ending at line 24 has been amended as follows.

The driving part 1006 for movement comprises a belt 1016 wound around pulleys 1026a and 1026b respectively provided on rotating shafts oppositely arranged at a prescribed interval, two pairs of roller units 1022a/1022b and 1024a/1024b and a motor 1018 for driving the belt 1016 joined to a carriage member 1010a of the recording part 1010 arranged ~~in substantial~~ substantially parallel to the roller units in forward and reverse directions.

The paragraph starting at page 46, line 19 and ending at line 24 has been amended as follows.

In the apparatus illustrated, a head of the serial type, in which ~~that~~ recording is conducted while scanning in the direction of the arrow S in Fig. 1, is used to conduct

recording at, for example, 1,200 dpi. ~~Driving~~ The driving frequency is 10 kHz, and ejection is conducted at the shortest time interval of 100 μ s in one ejection opening.

The paragraph starting at page 51, line 27 and ending at page 52, line 8 has been amended as follows.

In particular, the recording process according to the present invention has excellent effects in recording heads and recording apparatus of an ink-jet system, in which ~~that~~ thermal energy is utilized to form a droplet to be ejected, thereby conducting recording, among the ink-jet recording systems. With respect to the typical construction and principle thereof, those using the basic principle disclosed in, for example, U.S. Patent Nos. 4,723,129 and 4,740,796 are preferred.

The paragraph starting at page 54, line 22 and ending at page 55, line 9 has been amended as follows.

In the present invention, such an ink-jet recording apparatus as illustrated in Fig. 1, i.e., the apparatus of the serial type ~~that~~ in which formation of an image is conducted by repeating scanning of the recording head and feeding of the recording medium, is preferably used. However, the present invention is not limited thereto. For

example, the present invention may also be applied to an apparatus of the line type, in which ~~that~~ a full-line type recording head, in which a plurality of nozzles have been arranged over the overall width of a recording region of a recording medium, is used to conduct formation of an image. In any either case of the serial type and line type, the direction of relative scanning followed by an ejecting operation of the reaction liquid corresponds to a recording direction.

The paragraph starting at page 58, line 11 and ending at line 26 has been amended as follows.

The Reaction Liquid S1 and Color Pigment Inks K1, C1, M1 and Y1 obtained above were used to prepare a 1 cm-square print for evaluation of coloring property, show through and fixing ability on PB paper (product of Canon Inc.), which ~~that~~ is plain paper, by first applying Reaction Liquid S1 and then applying Color Pigment Inks K1, C1, M1 and Y1 by means of ink-jet recording heads. A print for evaluation of bleeding was prepared by combination of a back color and a character color in a similar manner, thereby regarding it as Print A1. The back color and character color were prepared by a combination of primary colors of Color Pigment Inks K1, C1, M1 and Y1 and secondary colors composed of a combination of these colors. Characters used in the evaluation were “電驚” of the Ming-style type, and the size of characters was a 8 point.

The paragraph starting at page 64, line 11 and ending at line 26 has been amended as follows.

In the expression 1, $V_d(pl)$ is an ejection volume per dot of the reaction liquid, $R_x(dpi)$ is a print resolution in a recording direction (direction of relative scanning), $R_y(dpi)$ is a print resolution in an arrangement direction of nozzles in a recording head, and $duty(\%)$ is a print duty of the reaction liquid. The expression 1 defines optimum reaction-liquid-ejecting conditions when the ink duty is 100%. Accordingly, the expression 1 must be always satisfied when the ink duty is 100%. However, the expression 1 may not be necessarily satisfied when the ink duty is not 100%. In a word, any mode may be included in the present invention so ~~far~~ long as it satisfies the expression 1 when at least the ink duty is 100%. It goes without saying that a mode always satisfying the expression 1 irrespective of the ink duty is also included in the present invention.